CLAIMS

1. An induction heating method for induction heating a helix-shaped coiled member, comprising:
placing an induction heating coil to surround helically a delivery path for delivering the coiled member, and
delivering the coiled member by rolling along the delivery path to induction heat the coiled member by the induction heating coil.

2. The induction heating method according to claim 1, wherein the induction heating coil has a portion which surrounds helically a delivery face for delivering the coiled member by contact.

3. The induction heating method according to claim 1 or 2, wherein the induction heating coil wound in a helix crosses the delivery direction of the delivery path to surround helically the delivery path and to extend in the direction of the delivery, and
the coiled member is delivered by rolling with the length direction of the coiled member directed to be perpendicular to the delivery direction.

4. The induction heating method according to claim 1, 2, or 3, wherein the coiled member is delivered by rolling by rotation in a periphery direction of the coiled member.

5. The induction heating method according to any of claims 1 to 4, wherein the delivery path for delivering the coiled member by rolling is inclined.

6. The induction heating method according to any of claims 1 to 5, wherein a middle-lifting means having ridges at a prescribed pitch along the delivery path is provided for supporting the coiled member upward at a lengthwise middle portion of the coiled member and for moving vertically the coiled member, and a pair of end-lifting means having ridges at a prescribed pitch along the delivery path are provided for supporting the coiled member upward at both lengthwise end portions and for moving vertically the coiled member, the ridges of the middle-lifting means and the ridges of the end-lifting means being placed in alternate positions; and
the coiled member is delivered by moving vertically reciprocally the middle-lifting means and the end-lifting means in alternate directions to allow the coiled member to roll on slopes of the ridges.

7. The induction heating method according to claim 6, wherein the pitch of the ridges of the middle-lifting means and of the end-lifting means is designed not to cause one or half rotation of the coiled member between the ridges in delivery by rolling, and
the coiled member is delivered by rolling by vertically moving the middle-lifting means and the pair of the end-lifting means.

8. The induction heating method according to claim 6 or 7, wherein the coiled member has the outside diameter increasing from the one lengthwise end toward the other lengthwise end, and
the one end-lifting means for supporting one lengthwise end is placed higher than the other end-lifting means for supporting the other lengthwise end.

9. The induction heating method according to claim 6 or 7, wherein the coiled member has the outside diameter increasing from the one lengthwise end toward the other lengthwise end, and
the one end-lifting means for supporting the one lengthwise end is placed higher than the other end-lifting means for supporting the other lengthwise end by inclining the end-lifting means and the middle-lifting means in a direction perpendicular to the delivery path.

10. The induction heating method according to any of claims 1 to 9, wherein a side wall is provided which rises at the respective edges in the width direction of the delivery path, and the coiled member which has a cut face at the respective ends of a predetermined length in the length direction is allowed to roll without contact at the cut face with the side wall.

11. The induction heating method according to claim 6 or 7, wherein the coiled member has the outside diameter differing between the one lengthwise end and the other lengthwise end, and
the one end-lifting means for supporting the one lengthwise end and the other end-lifting means for supporting the other lengthwise end are placed to hold the centers of the one end-lifting member and of the other end-lifting member at the same height.

12. The induction heating method according to claim 6 or 7, wherein the coiled member has the outside diameter differing between the one lengthwise end and the other lengthwise end, and

the one end-lifting means for supporting the one lengthwise end and the other end-lifting means for supporting the other lengthwise end are placed to hold the centers of the one end-of the coiled member and the center of the other end of the coiled member at the same height by inclining the end-lifting means and the middle-lifting means in a direction perpendicular to the delivery path.

13. The induction heating method according to any of claims 1 to 12, wherein only one of the middle-lifting means and the pair of the end-lifting means is moved vertically and the other is fixed instead of moving vertically the both of the middle-lifting means and the pair of the end-lifting means in alternate directions, thereby delivering the coiled member by rolling on the slopes of the ridges.

14. An induction heating apparatus, comprising a delivery means for delivering a helix-shaped coiled member by rolling, and
an induction heating means for induction heating the coiled member being delivered by the delivery means.

15. The induction heating apparatus according to claim 14, wherein the delivery means delivers the coiled member by rolling by rotation in direction of the periphery thereof.

16. The induction heating apparatus according to claim 15, wherein the delivery means comprises
a middle-lifting means having ridges at a prescribed pitch along the delivery path for supporting the coiled member upward at a lengthwise middle portion of the coiled member and for lifting vertically the

coiled member, and

a pair of end-lifting means having ridges at a prescribed pitch along the delivery path for supporting the coiled member upward at both lengthwise end portions and for moving vertically the coiled member:

the ridges of the middle-lifting means and the ridges of the end-lifting means being placed alternately; and

the coiled member is delivered by moving vertically reciprocally the middle-lifting means and the end-lifting means in alternate directions to allow the coiled member to roll on slopes of the ridges.

17. The induction heating apparatus according to any of claims 14, 15, and 16 wherein only one of the middle-lifting means and the pair of the end-lifting means is moved vertically and the other is fixed instead of moving vertically the both of the middle-lifting means and the pair of the end-lifting means in alternate directions, thereby delivering the coiled member by rolling on slopes of the ridges.

18. The induction heating apparatus according to claim 17, wherein the pitch of the ridges of the middle-lifting means and of the end-lifting means is designed not to cause one or half rotation of the coiled member between the ridges in delivery by rolling.

19. The induction heating apparatus according to claim 17 or 18, wherein the pair of the end-lifting members are constituted of one end-supporting means for supporting one lengthwise end of the coiled member and the other end-supporting means for supporting the other lengthwise end thereof, and

the one end-supporting member is placed at a level higher than the

other end-supporting member.

20. The induction heating apparatus according to claim 17 or 18, wherein the pair of the end-lifting members are constituted of one end-supporting means for supporting one lengthwise end of the coiled member and the other end-supporting means for supporting the other lengthwise end thereof, and
the pair of the end-lifting members and the middle-supporting member are inclined to place the one end-supporting member at a level higher than the other end-supporting member.

21. The induction heating apparatus according to any of claims 14 to 20, wherein a pair of side walls are provided which rise at the edges in the width direction of the delivery path, and
the coiled member which has a cut face at the respective cut ends formed in cutting in a predetermined length in the length direction is allowed to roll without contact at the cut face with the side walls.

22. A quench-hardening apparatus, comprising an induction heating apparatus set forth in any of claims 14 to 21, and
a quenching vessel for quenching the coiled member having been heated to a prescribed hardening temperature by the induction heating apparatus.